

Application/Control Number: 10/628,145

Art Unit: ***

CLMPTO

08/02/04

DB

Claims 1-29 (Cancelled)

5 30 4.

Rule 12.4

A time-of-flight mass spectrometer comprising:

an ion source that produces a primary beam of ionized particles;

transmission optics that focus said primary beam;

an extraction chamber that produces a secondary beam of ionized particles
from said primary beam;

25321054.1

EP147060720US

Art Unit: ***

- a flight tube that receives said secondary beam;
- an acceleration chamber that directs said secondary beam into said flight tube;
- an electron multiplier that receives said secondary beam and produces an electron emission in response to each particle in said secondary beam;
- 5 a first anode that has a first electrical potential and that receives a first portion of each said electron emission and produces a first signal in response;
- a second anode that has a second electrical potential different from said first electrical potential and that receives a second portion of each said electron emission and produces a second signal in response wherein
10 said second portion is different from said first portion due to said different second electrical potential;
- a first preamplifier that receives said first signal and produces a first amplified signal in response;
- a second preamplifier that receives said second signal and produces a second
15 amplified signal in response;
- a first constant fraction discriminator that receives said first amplified signal and produces a first pulse in response;
- a second constant fraction discriminator that receives said second amplified signal and produces a second pulse in response;
- 20 a first time-to-digital converter that receives said first pulse and produces a first digital signal representative of said first pulse's time of arrival;
- a second time-to-digital converter that receives said second pulse and produces a second digital signal representative of said second pulse's time of arrival; and,
- 25 a computer that receives said first digital signal and said second digital signal and produces an ion spectrum.

Art Unit: ***

318

A time-of-flight mass spectrometer comprising:

an ion source that produces a primary beam of ionized particles;

transmission optics that focus said primary beam;

an extraction chamber that produces a secondary beam of ionized particles from said primary beam;

a flight tube that receives said secondary beam;

an acceleration chamber that directs said secondary beam into said flight tube;

an electron multiplier that receives said secondary beam and produces an electron emission in response to each particle in said secondary beam;

a first anode that receives a first portion of each said electron emission and produces a first signal in response;

a second anode that receives a second portion of each said electron emission and produces a second signal in response wherein said second portion is different from said first portion due to the application of a magnetic field;

a first preamplifier that receives said first signal and produces a first amplified signal in response;

a second preamplifier that receives said second signal and produces a second amplified signal in response;

a first constant fraction discriminator that receives said first amplified signal and produces a first pulse in response;

a second constant fraction discriminator that receives said second amplified signal and produces a second pulse in response;

Art Unit: ***

a first time-to-digital converter that receives said first pulse and produces a first digital signal representative of said first pulse's time of arrival;

a second time-to-digital converter that receives said second pulse and produces a second digital signal representative of said second pulse's time of arrival; and,

a computer that receives said first digital signal and said second digital signal and produces an ion spectrum.

32
A time-of-flight mass spectrometer comprising:

an ion source that produces a primary beam of ionized particles;

transmission optics that focus said primary beam;

an extraction chamber that produces a secondary beam of ionized particles from said primary beam;

a flight tube that receives said secondary beam;

an acceleration chamber that directs said secondary beam into said flight tube;

an electron multiplier that receives said secondary beam and produces an electron emission in response to each particle in said secondary beam;

a first anode that receives a first portion of each said electron emission and produces a first signal in response;

a second anode that receives a second portion of each said electron emission and produces a second signal in response wherein said second portion is different from said first portion due to said flight tube's physical geometry;

a first preamplifier that receives said first signal and produces a first amplified signal in response;

a second preamplifier that receives said second signal and produces a second amplified signal in response;

Art Unit: ***

- 33
- 5 a first constant fraction discriminator that receives said first amplified signal and produces a first pulse in response;
- a second constant fraction discriminator that receives said second amplified signal and produces a second pulse in response;
- 5 a first time-to-digital converter that receives said first pulse and produces a first digital signal representative of said first pulse's time of arrival;
- a second time-to-digital converter that receives said second pulse and produces a second digital signal representative of said second pulse's time of arrival; and,
- 10 a computer that receives said first digital signal and said second digital signal and produces an ion spectrum.
- A time-of-flight mass spectrometer comprising:
- an ion source that produces a primary beam of ionized particles;
- transmission optics that focus said primary beam;
- 15 an extraction chamber that produces a secondary beam of ionized particles from said primary beam;
- a flight tube that receives said secondary beam;
- an acceleration chamber that directs said secondary beam into said flight tube;
- an electron multiplier that receives said secondary beam and produces an electron emission in response to each particle in said secondary beam;
- 20 a first anode that has a first electrical potential and that receives a first portion of each said electron emission and produces a first signal in response;
- a second anode that has a second electrical potential different from said first electrical potential and that receives a second portion of each said electron emission and produces a second signal in response wherein said second portion is different from said first portion due to the
- 25

Art Unit: ***

application of a magnetic field and said different second electrical potential;

a first preamplifier that receives said first signal and produces a first amplified signal in response;

5

a second preamplifier that receives said second signal and produces a second amplified signal in response;

a first constant fraction discriminator that receives said first amplified signal and produces a first pulse in response;

10

a second constant fraction discriminator that receives said second amplified signal and produces a second pulse in response;

a first time-to-digital converter that receives said first pulse and produces a first digital signal representative of said first pulse's time of arrival;

15

a second time-to-digital converter that receives said second pulse and produces a second digital signal representative of said second pulse's time of arrival; and,

a computer that receives said first digital signal and said second digital signal and produces an ion spectrum.

34
A time-of-flight mass spectrometer comprising:

an ion source that produces a primary beam of ionized particles;

20

transmission optics that focus said primary beam;

an extraction chamber that produces a secondary beam of ionized particles from said primary beam;

a flight tube that receives said secondary beam;

an acceleration chamber that directs said secondary beam into said flight tube;

Art Unit: ***

an electron multiplier that receives said secondary beam and produces an electron emission in response to each particle in said secondary beam;

a first anode that has a first electrical potential and that receives a first portion of each said electron emission and produces a first signal in response;

5 a second anode that has a second electrical potential different from said first electrical potential and that receives a second portion of each said electron emission and produces a second signal in response wherein said second portion is different from said first portion due to said flight tube's physical geometry and said different second electrical potential;

10 a first preamplifier that receives said first signal and produces a first amplified signal in response;

a second preamplifier that receives said second signal and produces a second amplified signal in response;

15 a first constant fraction discriminator that receives said first amplified signal and produces a first pulse in response;

a second constant fraction discriminator that receives said second amplified signal and produces a second pulse in response;

a first time-to-digital converter that receives said first pulse and produces a first digital signal representative of said first pulse's time of arrival;

20 a second time-to-digital converter that receives said second pulse and produces a second digital signal representative of said second pulse's time of arrival; and,

a computer that receives said first digital signal and said second digital signal and produces an ion spectrum.

25

35
6.

A time-of-flight mass spectrometer comprising:

Art Unit: ***

an ion source that produces a primary beam of ionized particles;

transmission optics that focus said primary beam;

an extraction chamber that produces a secondary beam of ionized particles
from said primary beam;

5 a flight tube that receives said secondary beam;

an acceleration chamber that directs said secondary beam into said flight tube;

an electron multiplier that receives said secondary beam and produces an
electron emission in response to each particle in said secondary beam;

10 a first anode that receives a first portion of each said electron emission and
produces a first signal in response;

a second anode that receives a second portion of each said electron emission
and produces a second signal in response wherein said second portion
is different from said first portion due to the application of a magnetic
field and said flight tube's physical geometry;

15 a first preamplifier that receives said first signal and produces a first amplified
signal in response;

a second preamplifier that receives said second signal and produces a second
amplified signal in response;

20 a first constant fraction discriminator that receives said first amplified signal
and produces a first pulse in response;

a second constant fraction discriminator that receives said second amplified
signal and produces a second pulse in response;

a first time-to-digital converter that receives said first pulse and produces a
first digital signal representative of said first pulse's time of arrival;

Art Unit: ***

a second time-to-digital converter that receives said second pulse and produces
a second digital signal representative of said second pulse's time of
arrival; and,

a computer that receives said first digital signal and said second digital signal
and produces an ion spectrum.

A time-of-flight mass spectrometer comprising:

an ion source that produces a primary beam of ionized particles;

transmission optics that focus said primary beam;

an extraction chamber that produces a secondary beam of ionized particles
from said primary beam;

a flight tube that receives said secondary beam;

an acceleration chamber that directs said secondary beam into said flight tube;

an electron multiplier that receives said secondary beam and produces an
electron emission in response to each particle in said secondary beam;

a first anode that has a first electrical potential and that receives a first portion
of each said electron emission and produces a first signal in response;

a second anode that has a second electrical potential different from said first
electrical potential and that receives a second portion of each said
electron emission and produces a second signal in response wherein
said second portion is different from said first portion due to the
application of a magnetic field, said flight tube's physical geometry,
and said different second electrical potential;

a first preamplifier that receives said first signal and produces a first amplified
signal in response;

a second preamplifier that receives said second signal and produces a second
amplified signal in response;